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announcement at Oxford, nor at any time since, until the 31st of January, did we utter a word suggesting that argon was an element; and it was only after the experiments upon the specific heats that we thought that we had sufficient to go upon in order to make any such suggestion in public. I will not insist that that observation is absolutely conclusive. It is certainly strong evidence. But the subject is difficult, and one that has given rise to some difference of opinion among physicists. At any rate, this property distinguishes argon very sharply from all the ordinary gases.

One question which occurred to us at the earliest stage of the enquiry, as soon as we knew that the density was not very different from 21, was the question of whether, possibly, argon could be a more condensed form of nitrogen, denoted chemically by the symbol N_3 . There seem to be several difficulties in the way of this supposition. Would such a constitution be consistent with the ratio of specific heats (1.65)? That seems extremely doubtful. Another question is, Can the density be really as high as 21, the number required on the supposition of N_3 ? As to this matter, Professor Ramsay has repeated his measurements of density, and he finds that he cannot get even so high as 20. To suppose that the density of argon is really 21, and that it appears to be 20 in consequence of nitrogen still mixed with it, would be to suppose a contamination with nitrogen out of all proportion to what is probable. It would mean some 14 per cent. of nitrogen, whereas it seems that from one-and-a-half to two per cent. is easily enough detected by the spectroscope. Another question that may be asked is, Would N_3 require so much cooling to condense it as argon requires?

There is one other matter on which I would like to say a word—the question as to what N_3 would be like if we had it.

There seems to be a great discrepancy of opinions. Some high authorities, among whom must be included, I see, the celebrated Mendeleef, consider that N_3 would be an exceptionally stable body; but most of the chemists with whom I have consulted are of opinion that N_3 would be explosive, or, at any rate, absolutely unstable. That is a question which may be left for the future to decide. We must not attempt to put these matters too positively. The balance of evidence still seems to be against the supposition that argon is N_3 , but for my part I do not wish to dogmatise.

A few weeks ago we had an eloquent lecture from Professor Rücker on the life and work of the illustrious Helmholtz. It will be known to many that during the last few months of his life Helmholtz lay prostrate in a semi-paralyzed condition, forgetful of many things, but still retaining a keen interest in science. Some little while after his death we had a letter from his widow, in which she described how interested he had been in our preliminary announcement at Oxford upon this subject, and how he desired the account of it to be read to him over again. He added the remark: "I always thought that there must be something more in the atmosphere."

LLOYD MORGAN UPON INSTINCT.

IN the last number of *Natural Science* Professor C. Lloyd Morgan gives a valuable synopsis of the various definitions of instinct which have been proposed by Darwin, Wallace, Romanes, James, Spencer and other writers upon this subject. He shows that surprisingly wide differences of opinion prevail and concludes that, "Since the question of origin is still *sub judice*, the definition should be purely descriptive, so as not to prejudge this question. And since the phenomena of instinct can only be rightly understood in their relation to automatism connate and acquired, to im-

pulse, to imitation and to intelligence, our definition of instinctive activities should find a place in a scheme of terminology." He sets forth such a scheme sending us in MSS. a number of additions and modifications which are embodied in the following table and abstract:

"It may be premised:

1. That the terms *congenital* and *acquired* are to be regarded as mutually exclusive. What is congenital is, as prior to individual experience, not acquired. What is acquired is, as the result of individual experience, not congenital.

2. That these terms apply to the individual, whether what is acquired by one individual may become congenital through inheritance in another individual, is a question of fact which is not to be settled by implications of terminology.

3. That the term *acquired* does not exclude an inherited potentiality of acquisition under the appropriate conditions, such inherited potentiality may be termed *innate*. What is acquired is a specialization of a vague and general innate potentiality.

4. That what is congenital and innate is inherent in the germ plasm of the fertilized ovum.

Congenital Movements and Activities: Those the performance of which is antecedent to individual experience; they may be performed either (a) at or very shortly after birth (*connate*) or (b) when the organism has undergone further development (*deferred*).

Congenital Automatism: The congenital physiological basis of those movements or activities which are antecedent to individual experience.

Physiological Rhythms: Congenital (or connate) rhythmic movements essential to the continuance of organic life.

Reflex Movements: Congenital, adaptive and coördinated responses of limbs or parts of the body; evoked by stimuli.

Random Movements: Congenital, more or less definite, but not specially adaptive movements of limbs or parts of the body; either centrally initiated or evoked by stimuli.

Instinctive Activities: Congenital, adaptive and coördinated activities of the organism as a whole; specific in character, but subject to variation analogous to that found in organic structures; similarly performed by all the members of the same more or less restricted group, in adaptation to special circumstances frequently recurring or essential to the continuance of the race; often periodic in development and serial in character.

Mimetic Movements and Activities: Due to individual imitation or similar movements or activities performed by others.

Impulse (Trieb): The affective or emotional condition, connate or acquired, under the influence of which a conscious organism is prompted to movement or activity, without reference to a conceived end or ideal.

Instinct: The congenital psychological impulse concerned in instinctive activities.

Control: The conscious inhibition or augmentation of movement or activity.

Intelligent Activities: Those due to individual control or guidance in the light of experience through association.

Motive: The affective or emotional condition under the influence of which a rational being is guided in the performance of deliberate acts.

Deliberate Acts: Those performed in distinct reference to a conceived end or ideal.

Habits: Organized groups of activities, stereotyped by repetition, and characteristic of a conscious organism at any particular stage of its existence.

Acquired Movements, Activities or Acts: Those the performance of which is the result of individual experience. Any modifications of congenital activities which result from experience are so far acquired.

Acquired Automatism: The individually modified physiological basis of the performance of acquired movements or activities which have been stereotyped by repetition."

Professor Morgan points out that there is some overlap in these definitions, but it is difficult to see how such overlaps are to be avoided.

H. F. O.

SOME MEANDERING RIVERS OF WISCONSIN.

Two years ago Professor Davis* called attention to the wide meanders of the Osage river of Missouri. He said: "The meanders of the river are peculiar in not being like those of the Mississippi, spread upon a flat flood-plain. High spurs of the upland occupy the neck of land between every turn of the stream. Evidently the meanders are not of the ordinary kind." He explained the peculiar tortuous course of the river as an inheritance from an earlier cycle, during which the river had worn the land down to a surface of faint relief. The stream at that time swung to and fro in broad meanders developed on a wide flood-plain. The whole region was then somewhat elevated, and the stream again set to work to cut down its channel to the new baselevel. But the meandering course which it had acquired late in the preceding cycle was carried over into the new cycle of its life.

A recent visit to a part of the driftless area of Wisconsin, Lafayette and Grant counties, gave me an opportunity of observing a similar habit of some of the rivers of that region. The general surface of the country is that of a gently rolling plain, at an elevation of from 850 to 1000 feet, A. T. The interstream surfaces are broad and slightly undulating, but well drained. The surface rock, except in the immediate vicinity of the streams, is the Galena limestone. Occasionally the general level of the top of the country is

broken by hills, which rise 200 to 300 feet above the general level. The highest of these are capped by the hard Niagara limestone; the lower by beds of the Cincinnati group. These hills form the so-called 'mounds,' of which, in the area visited, the Platte Mounds—1250–1300 feet, A. T.—are the highest. The hard Niagara limestone caps of these mounds are the remnants of beds which formerly stretched over all this region, and which has since been removed by denudation. To hills of this type Prof. Davis has given the name, Monadnocks.

The rocks of this region are nearly horizontal, and in general there is not a sharp contrast between the slant of the beds and the general slope of the upland surface. It seems, therefore, as if the upland might be a structural plain due to a resistant stratum, the Galena limestone, at the level of the upland—a stratum which had been revealed by denudation of the overlying beds. If this were the case, the upland level would be independent of any former baselevel. But such a conclusion does not seem to be admissible; although nearly horizontal, the limestone has been bent into gentle flexures, some of which are sufficient to bring the underlying Trenton limestone and St. Peter's sandstone up to the level of the upland surface. The plain is continuous across these low arches and bevels the edges of the gently inclined beds. Moreover, to the north of the outcrop of the Galena limestone, the upland plain bevels the gently inclined edges of the underlying formation, which there come to the surface. In that region, however, the plain is now more completely dissected than further south. Whatever correspondence exists between the inclination of the beds and the slope of the plain is fortuitous and not due to structure primarily. It is believed that this plain is a surface of denudation, the result of long continued erosion on a greater land mass when the land stood lower

*SCIENCE, April 28, 1893, vol. xxi., p. 225 et seq.
SCIENCE, November 17, 1893, vol. xxii., p. 276 et seq.